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THE PLANT DISEASE REPORTER

Issued By

Division of Mycology and Disease Survey

BUREAU OF PLANT INDUSTRY

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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THE PLANT DISEASE SURVEY

DIVISION OF MYCOLOGY AND DISEASE SURVEY

Volume XXV Number 2

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Fruit and vegetable diseases occurring on the New York market during the period from April to September, 1940, reported by C. O. Bratley and James S. Wiant, page 68, include a new phomopsis rot of Texas tomatoes.

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Dean E. Pryor reports an unusual occurrence of powdery mildew on one lettuce strain in field trials in California, page 74.

CHECK LIST REVISION

Freeman Weiss

CITRUS

(Occurring on Citrus spp. in general or on undetermined spp.)
Aegerita webberi Fawc., parasitic on larvae of white fly. Fla., West Indies.
Alternaria citri Ell. & Pierce, black rot, center rot, blossom-end rot, ?leaf spot. Widespread. A. tenuis Auth. also reported, probably identical.
Armillaria mellea Vahl ex Fr., mushroom root rot. Calif.
Aschersonia aleyrodis Webb. and A. goldiana Sacc. & Ell., parasitic on scale insects and white fly larvae, often prominent on leaves and twigs. Fla., West Indies. (Also A. turbinata Berk.)
Ascochyta sp., gummosis, wood rot. Calif.
Aspergillus alliaceus Thom & Church, A. flavus Lk., A. niger Van Tiegh., fruit rot (usually after prolonged storage). Occasional.
Atichia dominicana Cotton, on scale insects. West Indies.
Botryosphaeria ribis Gross. & Dug. (Dothiorella ribis (Fckl.) Sacc.), Dothiorella rot, bark canker, gummosis. Widespread. (Stem-end rot).
Botrytis cinerea Pers., gray mold of fruit, occasional; gummosis and twig blight, Calif.
Calonectria diploa (Berk. & Curt.) Wr., parasitic on scale insects. Gulf States.
Capnodium spp. (C. citri Berk. & Desm., C. citricolum McAlp. and others), sooty mold. Saprophytic on insect exudate but having indirect effects on foliage and fruit. Gulf States and West Indies.
Cassytha filiformis L., dodder-like plant. Fla.
Cephaleuros virescens Kze., algal leaf spot, "red rust", Gulf States, West Indies.
Cephalosporium lecanii Zimm., parasitic on scale insects. Fla., West Indies.
Cercospora spp. (C. aurantia Heald & Wolf, C. fumosa Penz.) on leaves. Fla., Texas.
(Cladosporium citri Fawc.): Sphaceloma fawcettii Jenkins. Conidial stage of Elsinoë fawcetti.
C. herbarum Lk. var. citricolum Farl., associated with scaly bark (see leprosis) and fruit blemish; probably secondary. Gulf States.
Clitocybe tabescens (Scop. ex Fr.) Bres., mushroom root rot. Fla.
(Colletotrichum gloeosporioides Penz.): Glomerella cingulata.
Coprinus atramentarius Fr., root rot, Calif. (Secondary).
Corticium koleroga (Cke.) Höhn. (C. stevensii Burt), thread blight. Gulf States, West Indies.
C. rolfsii (Sacc.) Curzi (Sclerotium rolfsii Sacc.), seedling blight, fruit rot. Gulf States, P. R.
C. salmonicolor Berk. & Br., pink disease, rubellosis. P. R.
C. solani (Prill. & Del.) Bourd. & Galz (Rhizoctonia solani Kühn), damping off, occasionally fruit rot. Cosmopolitan.

Cuscuta americana L., Cuscuta sp., dodder. Calif., Fla., West Indies.
Daldinia concentrica (Bolt. ex Fr.) Ces. & De Not. and Daldinia spp., wood rot. Occasional.
Dendropemon spp., mistletoe. West Indies.
Diaporthe citri Wolf (Phomopsis citri Fawc. P. californica Fawc., P. caribaea Horne), melanose (fruit and foliage), Phomopsis rot, decorticosis, gummosis. General. (According to Wehmeyer D. citri is a host form of D. medusaea Nit.) (Stem-end rot).
Diplodia natalensis Pole-Evans. A synonym of Diplodia (Botryodiplodia) theobromae (Pat.) Nowell and a widely used name for forms of Diplodia on Citrus, some of which have a perfect stage in Physalospora rhodina. Diplodia rot, twig blight collar rot, gummosis. General.
(Dothiorella ribis (Fckl.) Sacc.): Botryosphaeria ribis.
Dothiorella spp. (chiefly the preceding, possibly including other spp.) stem-end rot, dieback, gummosis. Widespread.
Elsinoë fawcetti Bitanc. & Jenkins (Sphaceloma fawcettii Jenkins), scab. Gulf States, West Indies, Cent. America. (The specific epithet of the conidial stage was published fawcettii, that of the ascigerous stage fawcetti.) (Verrucosis, sour orange scab).
Eutypella citricola Speg., on dead twigs.. Fla.
Fusarium spp. Associated with various pathological conditions as follows:

fruit rot -- F. avenaceum (Fr.) Sacc., F. orthoceras App. & Wr. Calif. Texas, West Indies.
gummosis and twig blight,-- F. lateritium Nees (conidial stage of Gibberella baccata (Wallr.) Sacc.), and F. solani (Mart.) App. & Wr. Calif., Fla. In collar rot and foot rot (see Phytophthora citrophthora and P. parasitica) F. lateritium (F. limonis Briosi) is often present as a secondary invader.
parasitic on scale insects, -- F. coccophilum (Desm.) Wr. (conidial stage of Nectria coccophila (Tul.) Wr.), F. juruanum P. Henn. (conidial stage of Calonectria diploa (Berk. & Curt.) Wr.), and F. scirpi (F. aleyrodis Petch). Gulf States.
root rot, -- Fusarium spp. Ariz., Calif., Fla., P. R.

Ganoderma lucidum (Leyss. ex Fr.) Karst., trunk rot. Fla., West Indies.
Gibberella baccata (Wallr.) Sacc., on twigs. Calif.
Gloeodes pomigena (Schw.) Colby, sooty blotch (fruit). Gulf States.
Gloeosporium spp., anthracnose, withertip. General. (Most of the many named spp. on Citrus are probably synonyms of Colletotrichum gloeosporioides.)
G. limetticolum Clausen, lime anthracnose and withertip. Fla., West Indies.
Glomerella cingulata (Ston.) Spauld. & Schrenk (Colletotrichum gloeosporioides Penz.), anthracnose (stain, spot or rot of fruit), withertip. General.
Hendersonula toruloidea Nattrass, gummosis, wood rot, fruit rot. Calif.
Heterodera marioni (Cornu) Goodey, root knot. Occasional.

CITRUS--Continued

Ionopsis utricularioides and Leochilus labiatus, epiphytic orchids causing branch girdling. P. R.

Leptosphaeria bondari Bitanc. & Jenkins, ?areolate leaf spot. P. R. (According to Stahel, areolate leaf spot is caused by Corticium areolatum Stahel and Leptosphaeria bondari is saprophytic. This Corticium has not been identified in P. R., the only source of a record of this disease within our territory.)

Leptothyrium pomi (Mont. & Fr.) Sacc., flyspeck (fruit). Gulf States, West Indies.

Macrophomina phaseoli (Maubl.) Ashby, root rot. Ariz., Calif., West Indies.

Meliola camelliae (Catt.) Sacc., M. citri (Br. & Pass.) Sacc., M. penzigi Sacc. = Capnodium.

Mucor paronychia Suth.-Camp. & Plunk., and Mucor racemosus, fruit rot. Calif.

Mycosphaerella lageriformis Peim, leaf spot. Calif.

Myriangium duriaei Mont. & Berk., parasitic on scale insects. Calif., Gulf States, West Indies.

Nectria coccophila (Tul.) Wr., parasitic on scale insects. Fla., West Indies.

Nematospora coryli Peg. and N. gossypii Ashby & Nowell, inspissosis (dry rot) of fruit, associated with insect punctures. Widespread.

Oidium tingitaninum Carter and Oidium sp., powdery mildew. Calif., ? Fla., West Indies.

Omphalia flavida (Cke.) Maubl. & Rang., leaf spot, P. R.

Cospora citri aurantii (Ferr.) Sacc. & Syd. (Oosporoidea citri-aurantii (Ferr.) Sunstine), sour rot. Cosmopolitan.

Penicillium spp. (P. digitatum Sacc., green mold; P. italicum Wehmer, blue or contact mold; P. roseum Lk., pink mold; P. stoloniferum Thom, and others). On all citrus fruits, cosmopolitan distribution.

Pestalotia (Pestalozzia) guepini Desm., on twigs. Gulf States, West Indies.

Phoma socia Wolf, secondary in lesions of bacterial canker. Gulf States.

(Phomopsis spp., including P. californica Fawc., P. caribaea Horne, and P. citri Fawc.): Diaporthe citri.

Phoradendron sp., mistletoe. Gulf States, West Indies.

Phyllosticta spp. P. aurantiicola (Berk. & Cke.) Sacc., P. erratica Ell. & Ev., P. hesperidearum (Catt.) Penz., P. longispora McAlp.), on leaves. Gulf States, West Indies.

Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.

Physalospora fusca N. E. Stevens and P. obtusa (Schw.) Cke., on twigs and branches. Calif., Gulf States.

P. rhodina (Cke.) Berk. & Cke. (Diplodia natalensis Pole-Evans), Diplodia rot, stem-end rot, gummosis, wood rot. General.

Phytomonas citri (Hasse) Bergey, canker (leaves, stems & fruit). Introduced into the U. S. about 1911 and subsequently found in all the Gulf States from Fla. to Texas. Eradication was drastically prosecuted and complete eradication from commercial citrus plantings was

CITRUS--Continued

apparently attained by 1939. A few collections on C. trifoliata have been made in La. and Texas in recent years. Present in Hawaiian and other Pacific Islands and in Eastern Asia.

P. syringae (Van Hall) Bergey, (Bacterium citriputeale C. O. Smith) blast (leaf & twig blight), black pit (fruit). Calif.

P. tumefaciens (EFS.) Bergey, crown gall, ?branch knot. Ariz., Calif.

Phytophthora citrophthora (Sm. & Sm.) Leonian (Pythiacystis citrophthora Sm. & Sm.), brown rot gummosis or collar rot, brown rot of fruit, leaf blight. Ariz., Calif., Fla., La., P. R., T. H.

P. megasperma Drechsl., root rot. Calif.

P. palmivora Butl., leaf & stem blight. P. R.

P. parasitica Dastur, foot or collar rot, gummosis (mal di gomma), brown rot of fruit. Calif., Gulf States, West Indies.

P. syringae Kleb. (P. hibernalis Carne), leaf blight, brown rot of fruit. Calif.

Pleospora herbarum (Pers. ex Fr.) Rabenh., dry black rot of fruit. Calif.

Pleospora sp. (?P. media Niessl. var. limonum Sacc.), leaf spot. Calif.

Podonectria coccicola (Ell. & Ev.) Petch, parasitic on scale insects. Fla., West Indies.

Polyporus spp. (P. adustus Willd. ex Fr., P. gilvus (Schw.) Fr., P. hirsutus Wulf ex Fr., P. lignosus Kl., P. versicolor L. ex Fr.), wound rot and trunk rot (secondary). Occasional.

Poria cocos Wolf, on roots. Fla.; P. vaporaria (Pers. ex Fr.) Cke., root rot. Calif.

Pythium sp., damping off. Calif.

(Rhizoctonia solani Kühn): Corticium solani.

Rhizopus nigricans Ehr., black mold rot of fruit. Occasional.

Rosellinia bunodes (Berk. & Br.) Sacc. and R. pepo Pat., black root. West Indies.

Schizophyllum commune Fr., wood rot occasionally on living trees. Cosmopolitan.

Sclerotinia sclerotiorum (Lib.) D By., cottony fruit rot, root rot, twig blight. Calif., Texas.

(Sclerotium rolfsii Sacc.): Corticium rolfsii

Septobasidium spp. (S. lepidosaphis Couch, S. pseudopedicellatum Burt, S. spongium (Berk. & Curt.) Pat.) felt fungus canker. Gulf States, West Indies.

Septoria citri Pass., leaf and fruit spot. Calif., Texas.

(Sphaceloma fawcettii Jenkins): Elsinoë fawcetti.

Sphaeropsis tumefaciens Hedges, branch knot, witches' broom. Fla., West Indies, ?T. H.

(S. coccophila Tul.): Nectria coccophila.

S. repens Berk. & Br., on roots, associated with red root disease but not proved pathogenic.

(Sporotrichum citri (Butl.) Doidge & Butl.): ?Sphaceloma fawcettii.

Stemphylium citri Patters. & Charles, end rot (fruit). Ariz. (Conidial stage of Pleospora herbarum?).

CITRUS--Continued

Torula dimidiata Penz., gummosis (following winter injury). Calif.
Trametes hydnoides Sw. ex Fr., T. hispida Bagl., wood rot. Calif.
Trichoderma viride Pers. ex Fr. (conidial stage of Hypocraea rufa Fr.), fruit rot. Occasional.
Tryblidiella rufula (Spreng.) Sacc., twig blight. Texas, P. R.
Tylenchulus semi-penetrans Cobb, in roots. Ariz., Calif., Fla., West Indies.
Ustulina vulgaris Tul., following foot rot. Fla., P. R.
Bronzing, -- magnesium deficiency. Fla.
Buckskin -- rust-mite (Phyllocoperus) injury on grapefruit and oranges. Fla.
Chlorosis, -- iron deficiency induced by excess of lime or lack of organic matter. Ariz., Calif., Fla. Marl chlorosis, -- manganese deficiency. Fla.
Exanthema ("ammoniation", dieback), -- excrescences on twigs and fruit and dying back of twigs; primarily copper deficiency but augmented by excessive nitrogen fertilization and bad drainage. Calif., Fla.
Greasy spot ("black melanose") of leaves (Chiefly grapefruit), cause unknown, Calif., Texas, West Indies.
Gum spot of foliage, -- physiogenic, probably environmental injuries.
Gummosis of trunk, branches and fruit, -- in part physiogenic, associated with adverse site conditions.
Leprosis, Florida scaly bark, "nailhead rust" of fruit, -- cause unknown. Fla.
Mottle-leaf foliocellosis, (frenching), -- zinc deficiency. Ariz., Calif., Fla.
Oleocellosis (rind-oil spot), -- chemical injury from release of oil in rind.

Psorosis (California scaly bark), -- virus (Citrivir psorosis Fawc.). 2 types designated as "common scaly bark" and "ring type" are recognized; possibly includes "concave gum", "blind pocket", "crinkly leaf" (in part) of lemon, and "infectious variegation". Calif., Fla., T. H., West Indies.
Silver scurf, -- thrips injury on fruit. Widespread.
Silvering, -- rust-mite injury on lemons. Fla.
Stigmonose, -- leaf spots induced by insect punctures. Occasional.
Tear stain of fruit, -- rust-mites followed by fungi, Occasional.
Wilt ("blight", "leaf curl"), -- physiogenic, associated with irregular water supply. Fla.

CITRUS AURANTIFOLIA (Christm.) Swingle, LIME. Cult. in S. Calif. and S. Florida; endemic and cult. throughout the West Indies.

Corticium salmonicolor Berk. & Br., pink disease, West Indies.
Diaporthe citri Wolf, melanose, Phomopsis rot (fruit), dieback, gummosis. Widespread. (Stem-end rot).

CITRUS--Continued

Diplodia natalensis Pole-Evans, Diplodia rot, charcoal rot, dieback, gummosis, stem-end.rot. General.
Elsinoë fawcetti Bitanc. & Jenkins, scab. Fla., West Indies, T. H.
Gloeosporium limetticolum Clausen, anthracnose, withertip. Calif., Fla., P. R., T. H. (Restricted to West Indian var.)
Glomerella cingulata (Ston.) Spauld. & Schrenk, associated with anthracnose and withertip. General.
Penicillium digitatum Sacc., green mold, P. italicum Wehmer, contact mold. Cosmopolitan.
Physalospora rhodina (Cke.) Berk. & Cke.: (Diplodia natalensis).
Phytomonas syringae (Van Hall) Bergey, blast. Calif.
Phytophthora citrophthora (Sm. & Sm.) Leonian, brown rot (fruit), brown rot gummosis. P. R., T. H.
P. parasitica Dastur, collar rot, mal di gomma. Fla., West Indies.
Sphaeropsis tumefaciens Hedges, branch knot. Fla., West Indies.
Sphaerostilbe repens Berk. & Cke., associated with red root disease. West Indies.
Tylenchulus semi-penetrans Cobb, in roots. Fla.
Dieback, -- physiogenic, associated with irregular moisture supply. West Indies.
Leprosis -- unknown. Fla. (Symptoms only on leaves.)
Red root, -- primarily physiogenic with accessory fungi. West Indies.
Stylar end-rot, -- physiogenic. Calif., Fla. (Especially on Persian (Tahiti) variety).

CITRUS AURANTIUM L., SOUR or SEVILLE ORANGE. Cult. chiefly for rootstocks, naturalized in Fla.
Alternaria citri Ell. & Pierce, black rot (fruit). Widespread.
Armillaria mellea Vahl ex Fr., root rot. Calif.
Botryosphaeria ribis Gross. & Dug., dieback, gummosis. Calif., Gulf States.
Corticium koleroga (Cke.) Höhn., thread blight. Fla., P. R.
Diaporthe citri Wolf, melanose, Phomopsis rot, dieback. Gulf States.
Diplodia natalensis Pole-Evans, Diplodia rot, gummosis, twig blight, stem-end rot. General.
Elsinoë fawcetti Bitanc. & Jenkins, scab. Gulf States, West Indies.
Glomerella cingulata (Ston.) Spauld. & Schrenk, anthracnose, withertip. General.
Leptosphaeria bondari Bitanc. & Jenkins, on leaves. P. R.
Mycosphaerella lageniformis Rehm, on leaves. Calif.
Omphalia flavida (Cke.) Maubl. & Rang., leaf spot, iron spot. P. R.
Penicillium spp., blue and green molds. Cosmopolitan.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Physalospora rhodina (Cke.) Berk. & Cke.: (Diplodia natalensis).
Phytomonas syringae (Van Hall) Bergey, blast. Calif.
Phytophthora citrophthora (Sm. & Sm.) Leonian, brown rot gummosis (resistant). Calif.
P. parasitica Dastur, foot rot (resistant). Fla., P. R.
Sphaeropsis tumefaciens Hedges, branch knot. Fla.

CITRUS--Continued

Tylenchulus semi-penetrans Cobb, in roots. Fla,
Exanthema, -- copper deficiency. Calif., Fla.
Leprosis, -- unknown. Fla.
Psorosis, -- virus(symptoms only in foliage). Calif.

CITRUS GRANDIS Osbeck, GRAPEFRUIT. Cult. chiefly in Fla., Texas, Ariz. and Calif. (Standardized Plant Names 1924 is followed, but the cultivated grapefruit is identified as C. MAXIMA var. UVACARPA by Merrill & Lee, and as C. PARADISI by Macfadden.)

Alternaria citri Ell. & Pierce, fruit rot. Ariz.
Botryosphaeria ribis Gross. & Dug., Dothiorella rot. Calif., Fla., Texas. (Stem-end rot).
Botrytis cinerea Pers., gummosis. Calif.
Cercospora aurantia Heald & Wolf, leaf spot. Texas.
Chaetothyrium hawaiiense Mendoza, on leaves. Fla.
Clitocybe tabescens (Scop. ex Fr.) Bres., mushroom root rot. Fla.
Corticium koleroga (Cke.) Höhn., thread blight. Fla.
C. salmonicolor Berk. & Br., pink disease. P. R.
Diaporthe citri Wolf, melanose, Phomopsis rot, bark disease, gummosis. Widespread. (Stem-end rot).
Diplodia natalensis Pole-Evans, Diplodia rot, gummosis, twig blight. General. (Stem-end rot).
Elsinoë fawcetti Bitanc. & Jenkins, scab. Gulf States, Canal Zone, West Indies.
Fusarium sp., dry rot (fruit), Ariz.; root rot, P. R.
Gloeodes pomigena (Schw.) Colby, sooty blotch. Fla.
Glomerella cingulata (Ston.) Spauld. & Schrenk, anthracnose, wither-tip. General. (Colletotrichum gloeosporioides).
Leptothyrium pomi (Mont. & Fr.) Sacc., flyspeck. Fla.
Oospora citri aurantii (Ferr.) Sacc. & Syd., sour rot. Occasional.
Nematospora coryli Pegl., dry rot (fruit). Calif., Fla.
Penicillium digitatum Sacc., green mold, and P. italicum Wehmer, blue mold. Cosmopolitan.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Physalospora fusca N. E. Stevens, on twigs. Fla.
P. rhodina (Cke.) Berk. & Cke.: (Diplodia natalensis).
Phytomonas syringae (Van Hall) Bergey, blast. Calif.
P. tumefaciens (EFS.) Bergey, crown gall. Texas.
Rhizoctonia solani Kühn, damping off. P. R.
Sclerotinia sclerotiorum (Lib.) DBy., cottony fruit rot. Calif.
Sclerotium rolfsii Sacc., seedling blight, fruit rot. Gulf States, P. R.
Septobasidium spongium (Berk. & Curt.) Pat., felt fungus canker. P. R.
Septoria citri Pass., leaf and fruit spot. Calif.
Sphaeropsis tumefaciens Hedges, branch knot. Fla.

CITRUS--Continued

Tryblidiella rufula (Spreng.) Sacc., on twigs. P. R.
Tylenchulus semi-penetrans Cobb, in roots. Ariz., Calif., Fla.
Phytophthora citrophthora (Sm. & Sm.) Leonian, brown rot (fruit), brown rot gummosis. Ariz., Calif., Fla., P. R.
P. palmivora Butl., blight (of nursery plants). P. R.
P. parasitica Dastur, brown rot (fruit), foot rot (mal di gomma).
Blotch (fruit), -- cause unknown. Fla.
Buckskin (fruit), -- rust-mite injury, Fla.
Exanthema, -- copper deficiency. Fla.
Greasy spot (foliage), -- cause unknown. Fla., West Indies.
Leprosis, -- unknown(resistant). Fla.
Lumpy rind (gum pockets), -- cause unknown. Fla., P. R.
Mottle leaf (frenching), -- zinc deficiency. Calif., Fla.
Oleocellosis, -- rind-oil stain of fruit.
Pitting, pox (stored fruit), -- low temperature, ?suboxidation.
Psorosis, -- virus. Calif., Fla., Texas.
Scald (stored fruit), -- low temperature, suboxidation.
Silver scurf (fruit), -- thrips injury.
Tear stain (fruit), -- rust-mites and fungi.
Watery breakdown (stored fruit), -- low temperature, overmaturity.
Wilt, blight, -- deficient or irregular water supply. Fla.
Yellow spot (foliage), -- cause unknown, possibly related to greasy spot. Fla.

CITRUS LIMONIA Osbeck, LEMON (including ROUGH LEMON, a var. of C. limonia used as a rootstock and also naturalized in Fla.). Cult chiefly in S. Calif., and Ariz.

Alternaria citri Ell. & Pierce (possibly other Alternaria or Pleospora spp.), center rot, stylar-end rot, leaf spot. Calif., Fla.
Armillaria mellea Vahl ex Fr., mushroom root rot. Calif.
Botryosphaeria ribis Gross. & Dug., Dothiorella rot (fruit), gummosis, Calif. (Stem-end rot).
Botrytis cinerea Pers., gray mold (fruit), gummosis. Calif.
Diaporthe citri Wolf, melanose, Phomopsis rot (fruit), gummosis. Calif., Fla. (Also causes shell-bark or decorticosis in Calif.)(Stem-end rot).
Diplodia natalensis Pole-Evans, Diplodia rot, dieback, gummosis, General.
Elsinoë fawcetti Bitanc. & Jenkins, scab, verrucosis. Gulf States, West Indies.
Glomerella cingulata (Ston.) Spauld. & Schrenk., anthracnose, withertip. General. (Colletotrichum gloeosporioides).
Macrophomina phaseoli (Maubl.) Ashby, root rot. Ariz., Calif.
Penicillium digitatum Sacc., green mold; P. italicum Wehmer, blue or contact mold; P. roseum Lk., pink mold. Cosmopolitan.
Phyllosticta hesperidearum (Catt.) Penz., on leaves. Fla.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Physalospora rhodina (Cke.) Berk. & Cke.: (Diplodia natalensis).

CITRUS--Continued

Phytomonas syringae (Van Hall) Bergey, blast, black pit (fruit). Calif.
Phytophthora citrophthora (Sm. & Sm.) Leonian, brown rot (fruit), brown rot gummosis, collar rot. Calif., P. R.
P. parasitica Dastur, brown rot (fruit), foot rot (mal di gomma). Calif., Fla.
Poria vaporaria (Pers. ex. Fr.) Cke., root rot. Calif.
Sclerotinia sclerotiorum (Lib.) DBy., cottony fruit rot, gummosis, root rot. Calif., Texas.
Septoria citri Pass., leaf and fruit spot. Calif.
Tryblidiella rufula (Spreng.) Sacc., twig blight. Texas.
Chlorosis -- mineral deficiency induced by excess lime. Calif., Texas.
Crinkly leaf, -- localized, probably a bud variation; systemic, probably virus.
Endoxerosis (internal decline of fruit, yellow tip), -- adverse moisture conditions during growth. Calif.
Leprosis, -- unknown. Fla.
Membranous stain (membranosis) of stored fruit,-- physiogenic. Calif.
Mottle-leaf, foliocellosis, -- zinc deficiency. Calif.
Oleocellosis, -- rind-oil stain of fruit.
Pitting (peteca) of stored fruit, -- low temperature, suboxidation.
Psorosis, -- virus (symptoms only in foliage). Calif.
Silvering, -- rust-mite and thrips injury on fruit.

CITRUS NOBILIS Lour., MANDARIN ORANGES, including the KING ORANGE, C. NOBILIS; TANGERINES and MANDARINS, C. NOBILIS var. DELICIOSA Swingle; SATSUMA ORANGE, C. NOBILIS var. UNSHIU Swingle; and TANGELO, C. NOBILIS X C. GRANDIS. Cult. chiefly in the Gulf States and Calif.

Alternaria citri Ell. & Pierce, black rot (fruit). Widespread.
Cercospora aurantia Heald & Wolf, leaf spot. Miss.
Clitocybe tabescens (Scop. ex Fr.) Bres., mushroom root rot. Fla.
Diaporthe citri Wolf, melanose, Phomopsis rot, dieback. Widespread.
Diplodia natalensis Pole-Evans, Diplodia rot, dieback, gummosis.
Elsinoë fawcetti Bitanc. & Jenkins, scab. Gulf States.
Nematospora coryli Peg., dry rot (fruit). Calif., Fla.
Oidium tingitaninum Carter, powdery mildew. Calif.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Physalospora obtusa (Schw.) Cke., on twigs and branches. Occasional.
P. rhodina (Cke.) Berk. & Cke.: (Diplodia natalensis).
Phytomonas syringae (Van Hall) Bergey, blast, black pit (fruit). Calif. Texas.
Phytophthora citrophthora (Sm. & Sm.) Leonian, brown rot (fruit), brown rot gummosis. Calif.
P. parasitica Dastur, brown rot (fruit), foot rot. Calif., Fla.
P. syringae Kleb., leaf blight, brown rot (fruit). Calif.
Tylenchulus semi-penetrans Cobb, in roots. Fla.

Exanthema, -- copper deficiency. Fla.
Greasy spot (of foliage), --cause unknown. Fla.
Psorosis, -- virus. Calif.

CITRUS SINENSIS Osbeck, COMMON or SWEET ORANGE. Cult. chiefly in Fla., Texas, Ariz., Calif.

Alternaria citri Ell. & Pierce, black rot (fruit), navel end rot, possibly a factor in June drop. Widespread.
Armillaria mellea Vahl ex Fr., mushroom root rot. Calif.
Botryosphaeria ribis Gross. & Dug., Dothiorella rot, stem-end rot. Calif.
Botrytis cinerea Pers., fruit rot, gummosis. Calif.
Candelospora citri Fawc. & Klotz, fruit rot. Calif., Fla.
Cercospora aurantia Heald & Wolf, leaf spot. Texas.
Clitocybe tabescens (Scop. ex Fr.) Bres., mushroom root rot. Fla.
Corticium koleroga (Cke.) Höhn., thread blight. Fla., P. R.
C. salmonicolor Berk. & Br., pink disease, P. R.
Diaporthe citri Wolf, melanose, Phomopsis rot, dieback, bark disease. Widespread. (Stem-end rot).
Diplodia natalensis Pole-Evans, Diplodia rot, dieback, collar rot, gummosis. General. (Stem-end rot).
Elsinoë fawcetti Bitanc. & Jenkins, scab (practically immune). Fla.
Fusarium spp., fruit rot, root rot, twig blight. See under Citrus spp.
Glomerella cingulata (Ston.) Spauld. & Schrenk, anthracnose, withertip. General. (Colletotrichum gloeosporioides).
Nematospora coryli Peg. and N. gossypii Ashby & Nowell, dry rot (fruit). Widespread.
Oospora citri aurantii (Ferr.) Sacc. & Syd., sour rot. Occasional.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Physalospora rhodina (Cke.) Berk. & Cke.: (Diplodia natalensis)
Phytomonas syringae (Van Hall) Bergey, blast, black pit (fruit). Calif.
Phytophthora citrophthora (Sm. & Sm.) Leonian, brown rot (fruit), brown rot gummosis. Calif., Gulf States, P. R.
P. parasitica Dastur, brown rot (fruit), foot rot (mal di gomma), Calif., Fla., Texas, P. R.
P. syringae Kleb., brown rot (fruit), leaf blight. Calif.
Sclerotinia sclerotiorum (Lib.) D By., cottony fruit rot, twig blight. Calif.
Sphaeropsis tumefaciens Hedges, branch knot. Fla.
Tylenchulus semi-penetrans Cobb, in roots. Calif., Fla.
Brown spot of navel oranges, -- immaturity of fruit when picked. Calif.
Chlorosis, -- mineral deficiency induced by excess lime. Calif.
Concave gum disease (form of psorosis), -- virus. Calif.
Creasing, puffing, -- fruit abnormality associated with overmaturity.
Exanthema, -- copper deficiency. Calif., Fla.
June drop, -- physiogenic, adverse moisture and temperature conditions. Calif.
Leprosis, --unknown. Fla.
Lumpy rind, -- fruit abnormality, cause unknown. Fla.
Mottle-leaf (foliocellosis, frenching), -- zinc deficiency. Calif., Fla.

CITRUS--Continued

Oleocellosis, -- rind-oil stain of fruit.
Pitting or pox (stored fruit), -- low temperature, suboxidation.
Psorosis (California scalybark), -- virus. Ariz., Calif., Fla., P. R.
Russeting of fruit, -- rust-mite (Phyllocoptrus oleivorus Ashm.).
(Other manifestations of this injury are known locally as buckskin, sharkskin, and tear stain.)
Silver scurf of fruit, -- feeding injury by thrips. Widespread.
Stigmonose (of foliage), -- insect punctures. Calif., Fla.
Wilt, blight, -- physiogenic, deficient or irregular water supply. Fla.

CITRUS TRIFOLIATA L. (Poncirus trifoliata Raf.), HARDY ORANGE. Native of China but naturalized in Growth Regions 17, 20, 29, 30; used as a rootstock for Satsuma oranges and cult. as an ornamental.

Diaporthe citri Wolf, melanose, dieback. Gulf States.
Diplodia natalensis Pole-Evans, dieback, gummosis. General.
Elsinoë fawcetti Bitanc. & Jenkins, scab. Miss.
Glomerella cingulata (Ston.) Spauld. & Shrenk., anthracnose, dieback. Gulf States.
Phymatotrichum omnivorum (Shear) Dug., root rot. Texas.
Phytomonas citri (Hasse) Bergey, canker. Occasional in La. and Texas.
Physalospora obtusa (Schw.) Cke., on twigs. Gulf States.
P. rhodina (Cke.) Berk. & Cke.: (Diplodia natalensis).

(Division of Mycology and Disease Survey.)

THE EELGRASS SITUATION, FALL 1940

Clarence Cottam

Introduction

The Fish & Wildlife Service has followed with interest the condition and relative abundance of eelgrass (Zostera marina) since its abrupt and almost complete disappearance along the Atlantic coast of the United States in 1931. Constant watch has been kept to determine the effects of this disappearance on coastal waterfowl in particular and on aquatic life in general. Because no detailed report on this wildlife food and economically important aquatic plant has been published during the past two years it seems appropriate to summarize the situation at this time.

By way of review it may be stated that eelgrass is a type of perennial submerged salt-water or brackish-water plant of the pondweed family, and ordinarily grows in dense mats in water from a few inches to 10 or 12

feed deep on mud flats of the coastal bays and estuaries. It is of wide distribution and occurs on the Atlantic coast from Bogue Sound in southern South Carolina to southern Labrador, with outlying stations further north on the Labrador coast and in southern Greenland and James Bay. The same species or varieties also occur on our Pacific coast and in northern Arctic waters as well as on the coast of Europe, including the northern Mediterranean region. Related species occur along the coast of both the Northern and Southern Hemispheres.

There may be some encouragement in the knowledge that there have been past periods of eelgrass scarcity.1/ Evidence at hand, however, indicates that none of these, at least in historical times, has compared in intensity, duration or completeness with the present catastrophe. Past periods of lessened production in extensive areas before the present extreme exhaustion beginning 1931 were in 1889, 1893-95, 1908, 1913, and 1920. The degree of destruction and extent of area affected, both on the American and European Atlantic coasts, varied considerably.

Eelgrass is an important food for sea brant, geese, and coastal ducks and it also serves as a basic constituent of an important habitat for small invertebrate life, especially for crustaceans and mollusks, which also comprise important food items for many waterfowl, fish, and even for mankind. The alarming scarcity of sea brant, certain mollusks, and certain coastal fish is at least in part traceable to the destruction and scarcity of the eelgrass. It may be said that this plant affected directly or indirectly most of the animal life in the regions where it grew. The plant also had a direct economic importance, as it was an article of commerce and was harvested for packing material, upholstery, stuffing, insulation, and as a compost for fertilizer. Furthermore it served as an effective break-water that helped to prevent erosion of the coastal bays, estuaries, and the shoreline. Much has been written concerning the cause of this malady which has no counterpart in botanical history in rapidity of its destruction of a plant species. 2/ Renn reports that a mycetozoan

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1/ Cottam, C. Past periods of eelgrass scarcity, [illegible]. Rhodora 36:261-264, 1934.

Further notes on past periods of eelgrass scarcity. Rhodora 37:269-271. 1935.

2/ See especially: Stevens, Neil E., Environmental factors and the wasting disease of eelgrass. Rhodora 41: 260-262. 1939; Renn, Chas. E., The wasting disease of Zostera marina. Biol. Bull. 70:148-158. 1936; Young, Ed. L. III, 1938 Recent investigations on the eelgrass problems: Preliminary Report. Bull. of Mount Desert Inl. Biol. Lab. 1938; and Labyrinthula on Pacific coast eelgrass, Can. Journ. Res. 16:115-117. 1938; Cottam, Clarence, The present situation regarding eelgrass (Zostera marina). Wildlife Research' Management Leaflet Bs-3, 7pp. 1935.

(Labyrinthula), a low form of fungus, is immediately responsible for the disease, however, the complete story of its cause is unknown and it must be regarded as one of the most interesting and amazing biological phenomena of recent times.

Present Conditions

A characteristic noted since the first onslaught of this wasting disease is the repeated sporadic attempts of the plant to reestablish itself. While numerous local growths of the plant have been reported, most of these were short lived. It is gratifying to report that the present condition of the plant shows encouraging improvement although evidence of the disease is still far too apparent and the plant is perhaps only 10 percent as abundant as it was 10 years ago. It appears that either a more resistant strain of the plant is developing or else the disease is gradually becoming much less virulent.

Whatever the explanation for improvement, it may be stated that the best and most extensive recovery has occurred in areas of reduced salinity such as in river-fed bays and estuaries or at the mouths of rivers. To interpret this data properly one should remember that the most widespread destruction of eelgrass usually occurs late in the summer or early in the fall. It is at this period that most drift becomes washed ashore in windrows. Drift is least in evidence late in summer or early in spring before new growth begins.

Explanation is wanting to account fully for the lack of uniformity in conditions of the plant at different parts of the coast. While areas of reduced salinity usually show the best recovery there are some noticeable exceptions. In general the plants in the southern parts of the range show somewhat the best recovery although a broad belt in the center of the range shows the poorest conditions of any that may now be found along our entire coast.

Atlantic Coast of Canada

Information from Canada received during May and June indicates variable conditions. Some areas offer considerable encouragement, others show local improvement only, while still others present conditions about as they have been for the past four or five years. On the coast of the Province of Quebec Dr. Harrison F. Lewis, Chief Federal Migratory Bird Officer of Quebec, reported that he knew of "no significant improvement in the condition of eelgrass in recent years." Concerning the Maritime Provinces of New Brunswick, Nova Scotia, and Prince Edward Island, he concluded from a perusal of reports that "there has been definite local improvement...in a number of widely scattered bays and harbors."

Improvement seems to have been most noticeable on the coast of Nova Scotia. Dr. Lewis states, however, that similar intervening coastal waters have shown little or no improvement. R. W. Tufts, Chief Federal Migratory Bird Officer of the Maritime Provinces, in summarizing the situation

in his district, wrote that he was led to believe that at some points the eelgrass had made a satisfactory recovery, while in other areas there was no vestige of the plant whatsoever. At still other places the disease appeared to be rampant even though on the whole it was his impression that there was considerably more eelgrass along the Canadian coast than there was four or five years ago. Mr. Tufts stated that the commercial dealers were harvesting the plant in a few areas as they formerly did.

New England

In July, U. S. Game Management Agent Samuel T. Miller found an encouraging increase in the eelgrass in a number of bays along the coast of Maine. In the vicinity of Wildwood and at other points along the long and irregular Maine coast he found sizeable beds which clam diggers informed him had only recently appeared. Much of the new growth appeared to have come from seed. He also found good growth of the plant in the vicinity of Broad Cove, Cousins Island, and Chebeague Island. Specimens from various beds seemed to be surprisingly healthy. He estimated upwards of a 25 percent increase of the plant along the coast of the State over conditions of the preceding year.

Conflicting reports were received from Massachusetts indicating local improvement only. U. S. Game Management Agent Brackett stated that while the disease was still in evidence most of the eelgrass beds were covering a somewhat larger area than they did one or two years ago.

Conditions on the coast of Rhode Island and Connecticut also seem to be variable although some improvement is noted. Assistant Biologist John J. Lynch, late in September, found dense beds in Narrow River, Washington County, Rhode Island with leaves of normal width and 30 to 40 inches in length. He writes that "the stand of grass in this locality is the first that could be considered normal that I have seen in my entire work on the coast." Encouraging but less noticeable improvement was also found by Mr. Lynch or the writer at Sea Powett, Quonochontag Pond and in the vicinity of Westerly. While some disease was in evidence most of the plants seemed healthy and contained long firm internodes. Disease seemed less prevalent than at any time during the past eight years.

Long Island, New York

Reports from Long Island made before the growing season last spring indicate a slight improvement of the eelgrass although the conditions were still regarded as "nothing to become enthused over." Some beds had become diseased and largely disappeared while others appeared fairly healthy and were increasing in the extent of area covered. Best improvement seemed to be in Shinnecock Bay and in the vicinity of Fire Island and East Island, Great South Bay, and the southeast fork of Long Island. Little or no improvement was noted on most of the north shore although some growth was known to occur there. At Peconic and Moriches Bays it was hard to find even a trace of eelgrass.

In December, 1940 U. S. Game Management Agent Orin D. Steele, reported a marked improvement of the plant in the vicinity of Cape Tree Island, Great South Bay. At Three Mile Harbor near Sag Harbor on the north shore of Suffolk County fishermen report that fishing is difficult because of the dense stands of eelgrass. At a number of other points Mr. Steele indicates that "the grass has taken on new life" during the past six months.

New Jersey and the Delmarva Peninsula

I can not adequately explain the almost complete absence of eelgrass in most of the more saline bays along the coast of New Jersey and the Delmarva Peninsula. There is little improvement here and the condition in this vast section of the coast is probably less favorable than on any other unit of coastal America within the normal range of eelgrass. In the less saline units of Barnegat Bay, New Jersey, and particularly in those areas near river outlets, some beds of short eelgrass with leaves not over eight inches long are to be found. Conditions here, however, seem to show little improvement during the past year. Concerning the more open bays, Game Management Agent Albert Stadlmeir, writes that occasionally he finds small beds of young eelgrass which often have the seeds attached. This indicates fruiting plants (which are at least three years old) somewhere in the vicinity and consequently offers some encouragement that the plant will become reestablished. It is fortunate indeed that Wigeongrass (Ruppia maritima) has taken over much of the area formerly occupied by eelgrass.

A small amount of eelgrass is said to occur in Chincoteague Bay, Virginia, where it might be increasing slowly. Thomas J. Reed, who has conducted transplanting experiments in this region for three years, states that most of his plants have lived but have done poorly and have failed to seed or spread. Plantings of healthy west coast eelgrass by the Fish & Wildlife Service to an area on the New Jersey coast likewise ended in complete failure.

U. S. Game Management Agent A. W. Souder reports a marked improvement on the sea side of the Delmarva Peninsula although many extensive areas still contain little or no eelgrass. He adds that sea brant, which are especially fond of eelgrass, are an important factor in preventing the spread of the plant. He states that as soon as the brant arrive in the fall and discover the grass, they continue to feed on it until it is all destroyed.

Chesapeake Bay

Eelgrass in Chesapeake Bay is widely scattered and occurs in almost normal abundance in many places. Drift in large windrows along the shore is reminiscent of conditions prior to 1931. In most places the plants are largest and most healthy in the least saline areas. Game Management Agent Souder states that he has taken samples all over the Bay and finds the increase and improvement is uniformly encouraging. At

Honga River and Tarr Bay the major part of the growth is from six to eight inches long although in deeper water plants of twenty inches in length are not uncommon. It is to be remembered that the plants in the southern part of the eelgrass range are decidedly narrower and smaller than those farther north along the coast. While the plants in Chesapeake Bay now look relatively healthy there are extensive mats of black dead rootstocks. In this area nearly all of the internodes are short and connected with blackened dead rootstocks that probably died a year ago. Some disease is in evidence although it is apparent that new growth at least keeps pace with the destruction of the plant. Citizens at Hooper's Island report that the severe winter a year ago along with excessive shell fishing destroyed much of the growing plant material. In the vicinity of Solomon's Island and adjacent areas where river water dilutes the salt content of the bay, the eelgrass seems nearly, if not entirely, normal.

Dr. Curtis Newcombe, Director of the Virginia fisheries laboratory at Yorktown, Va., indicates in a press release a marked improvement of eelgrass in the Yorktown section. Dr. R. V. Truitt, Director of the Chesapeake Biological Laboratory, University of Maryland likewise gives evidence of a satisfactory recovery of the plant in the vicinity of Solomons Island, Maryland.

Mr. F. M. Uhler, Biologist of the Fish and Wildlife Service, in December, 1940 found the plant abundant in the vicinity of St. George Island. He stated that the conditions there seem practically normal and certainly the best that he had observed since the disappearance of the eelgrass in 1931.

Coastal North Carolina

A wide distribution and continued improvement are noted in eelgrass in the extensive Pamlico Sound area. The present growth, although still far below normal, is the best that has occurred since the initial destruction of the plant in 1931. The plants seem relatively healthy although some evidence of the disease may still be found.

Refuge Manager Maynard S. Johnson reports improvement of eelgrass at the Swans Quarter Refuge although observation by the writer indicates that the plant is much less abundant here than in many units in Pamlico Sound. Conditions at Bogue Sound, the southern extremity of eelgrass range, appear to be about as they were a year ago.

Summary of Conditions

The eelgrass situation is not uniform. In general areas of reduced salinity show the best recovery. In sections of Chesapeake Bay conditions seem almost normal and in units of Pamlico Sound and more localized portions of coastal New England, the plant is perhaps 10 to 50 percent as abundant as it was before 1931. In less favorable areas

the plant exists in small isolated plots only or not at all. It is gratifying to report that, considering the Atlantic coast area as a whole, conditions are better than they have been at any time since the onset of the wasting disease in 1931. The present trend encourages the hope that the disease will ultimately pass and conditions will again be restored to normal.

(U. S. Department of the Interior, Fish and Wildlife Service).

SPREAD OF WHITE PINE BLISTER RUST DURING THE CALENDAR YEAR 1940

Division of Plant Disease Control,
Bureau of Entomology and Plant Quarantine.

In the Southern Appalachian Region, blister rust [Cronartium ribicola] was found in 1940 for the first time on Ribes in Mineral, Grant, Hampshire, Morgan and Berkeley Counties, West Virginia, and in Clarke County, Virginia. Scouting in West Virginia indicated a light Ribes infection over the area as a whole. In Virginia, the diseased Ribes found for the first time in Clarke County occurred at two locations about fifteen miles apart. The Ribes were cultivated bushes and the leaves were well infected. Three new pine infection centers were found in Page County, Virginia, three in Rockingham County, eight in Highland County and one in Augusta County, but other infection areas in these counties were already known. On white pine, blister rust was found for the first time in Hampshire County, West Virginia. In Maryland, the southeastern counties were scouted for rust and none was found.

In the North Central Region the rust was found on Ribes for the first time in Jackson and Ingham Counties, Michigan, Todd and Olmstead Counties, Minnesota, and Blackhawk County, Iowa. On white pine it was found for the first time in Iowa County, Wisconsin, Goodhue County, Minnesota, and Alger, Jackson, Presque Isle and Charlevoix Counties, Michigan. Rust on either pines or Ribes, or both, is now known to be present in all Wisconsin counties, in all but four Michigan counties, in the northern and eastern portions of Minnesota, in northeastern Iowa, and in the northern half of Ohio. In Illinois and Indiana Ribes infection has been found in northern counties, but no infected pines have been reported. No new counties in Illinois, Indiana, and Ohio were added to the infected list this year.

White pine blister rust is generally distributed throughout the Northeastern States on both host plants and in many sections damage to large-sized pines is becoming increasingly noticeable in unprotected areas. Observations show that the disease continues to spread unchecked in areas where Ribes are present but that effective control has been accomplished on those tracts from which these bushes have been removed. During the

"fruiting"season, the aecial stage on white pine was more abundant than normal in northern New England and New York. This was followed by a wet spring, and infection on Ribes was heavier than usual on both wild and cultivated bushes.During the latter part of the summer and early fall, dry conditions prevailed and the amount of pine infection resulting from the diseased Ribes may not be as great as was indicated by early summer conditions.

In the western white pine region of eastern Washington, northern Idaho and western Montana, the known infected area remains the same as at the end of the calendar year 1939. With pine infection scattered over all of the white pine belt of the Inland Empire, infection may be found on Ribes each year in all parts of this area where these bushes occur in any number. Consequently, the rust is intensifying to some extent in those parts of the white pine type from which the Ribes have not yet been removed, and at a greatly increased rate in those unprotected drainages where the disease has been present for several years, particularly in the younger stands. There has been little apparent long-distance spread from the Inland Empire white pine belt toward the white pine stands of Wyoming and Colorado. Scouting in the Gallatin National Forest at a point 19 miles from Yellowstone National Park where Ribes infection was found in 1937, revealed negative results on both the Ribes and the limber pines. Additional scouting in and adjacent to both Yellowstone and Grand Teton National Parks also failed to show any evidence of blister rust.

In California an important development in the spread of the rust was the discovery of two infected sugar pines along Bailey Creek near Viola (Shasta County) on the Lassen National Forest in the general vicinity of Ribes infections found there in 1938. This infection places the known southern limits of pine infection in California about 107 miles south of the Oregon border and is the first record on pine in Shasta County. One small sugar pine was found infected in the Montgomery Creek area, also in Shasta County, where there were numerous infected Ribes in 1938.

Scouting in the Shasta and Klamath National Forests in California from late August through September was directed primarily toward determining the extent to which infection had become established on pines as a result of previous years' spread of the rust to Ribes, especially from the wave of Ribes infection which blanketed the Klamath National Forest and extended more lightly over the Shasta National Forest in 1937. Results on the Shasta National Forest were negative. Over the moister regions of the Klamath National Forest, however, it was found that a widespread return of infection to sugar pines, which were situated near Ribes that were infected in 1937, had taken place. Some diseased trees were found as far south as the latitude of Somes Bar, about 45 miles south of the Oregon border. The infections were distributed in 14 principal locations falling in three general areas: The Indian Creek basin, the Elk Creek basin, and the Klamath River from Happy Camp to Somes Bar. In the 14 centers of infection there were 250 diseased sugar pines having a total of 928 cankers, an average of 3.7 cankers per tree. The largest infection center numbered 105 trees with 550 cankers. Although the

cankers originated largely in 1937, and some had developed pycnia for two successive seasons. None had produced aecia. A thorough examination of all drainage basins in the Klamath National Forest was not practicable but a sufficiently representative sample of infection conditions was obtained to indicate that pine infection is probably thinly scattered over the entire sugar pine area of the Klamath National Forest. Some loss on this forest can be anticipated before the more valuable stands of sugar pine can be cleared of Ribes.

Counties in which blister rust was found for the first time on white pines or Ribes in 1940 by States and Regions

Region	State	County	Infection found on: Pine	Ribes	Host plant
North Central	Iowa	Blackhawk		x	R. nigrum
	Michigan	Alger	x		P. strobus
		Charlevoix	x		P. strobus
		Ingham		x	R. americanum
		Jackson	x	x	P. strobus and R. cynosbati
		Presque Isle	x		P. strobus
	Minnesota	Goodhue	x		P. strobus
		Olmstead		x	R. cynosbati
		Todd		x	---
	Wisconsin	Iowa	x		P. strobus
Southern Appalachian	Virginia	Clarke		x	R. vulgare and reclinata
	West Virginia	Berkeley		x	R. grossularia
		Grant		x	R. rotundifolium and cynosbati
		Hampshire	x	x	P. strobus and R. cynosbati
		Mineral		x	R. cynosbati
		Morgan		x	R. aureum
Pacific Coast	California	Shasta	x		P. lambertiana

The negative results obtained in scouting for the rust on Ribes in California in 1940 indicates that this year, like last, was unfavorable for long-distance spread of the rust from the pine infection centers in the north to Ribes in California. Although scouts located numerous rust infections on Ribes, all of those submitted to the Division of Forest Pathology, Bureau of Plant Industry, for identification turned out to be Cronartium occidentale (pinyon rust).

CERATOSTOMELLA ULMI ISOLATED FROM ELM WOOD OF DISH CRATES IMPORTED FROM ENGLAND

R. P. True

Ceratostomella ulmi, the fungus causing the Dutch elm disease, has recently been isolated from wood used in the crating of dishes imported from England. The crates were intercepted at the Port of New York during the latter part of August 1940 and called to our attention by Mr. Max Kisliuk, Inspector in Charge.

Examination of the crates on the docks and in store houses revealed that elm wood had been used in the construction of several and some of the elm sticks were subsequently obtained for laboratory inspection and culturing. One of the sticks showing vascular discoloration of the type commonly associated with Ceratostomella ulmi infection yielded the Dutch elm disease fungus when cultured.

The crates were composed of round, half-round, or split uprights and side pieces which frequently were from one to two and a half inches in thickness. They usually had bark on and appeared in many cases to have been cut green for the construction of the crates. This framework was bound together by withes of small diameter threaded or tied through holes bored in the larger pieces and formed an enclosure for the wheat straw in which the dishes were packed.

It has been previously noted [1/] that crates of this type could easily serve as modes of entry for European disease fungi, and efforts have been made to prevent their continued use or at least to bar the utilization of elm wood in their construction.

(Division of Forest Pathology, Bureau of Plant Industry, U. S. Department of Agriculture, Morristown, New Jersey).

1/ Verrall, A. F. The possibility of the entry of fungi in the woods of European packing materials. Unpublished office report Jan. 2, 1935. Division of Forest Pathology, Bureau of Plant Industry, U.S.Dept. of Agriculture, Morristown, New Jersey.

FREEZING INJURY TO TREES AND NURSERY STOCK IN NEBRASKA AND KANSAS DURING NOVEMBER 1940.

Ernest Wright

Nebraska, Kansas, and the midwestern section of the United States was subjected to an unprecedented November cold wave this year. U. S. Weather Bureau records show that temperatures during the first 10 days of the month were about normal with a high of 71°F. recorded at Lincoln, Nebraska, on the fourth. The lowest temperature for the same period was 31 degrees on November 6. From November 11 to 15, inclusive, the temperature dropped to 1° below zero and never reached higher than 23°. By the eighteenth the weather had moderated and the thermometer again registered above freezing. During the cold spell there were temperatures as low as 12° below zero recorded in central Nebraska and -16° in the northwestern part of the State. Temperatures at Wichita, Kansas, during the same period dropped to 9° above zero. The unusual severity of this early cold wave was undoubtedly detrimental to vegetation not yet in a state of dormancy. The damage was no doubt further accentuated by temperatures in the neighborhood of 8° above normal in October, in which month rainfall had been above normal in eastern Nebraska and below normal in Kansas.

The severity of the damage can not be fully determined until this coming spring, but some notes taken on the injury to trees and shrubs during and immediately after the cold spell may be of interest (Table 1.).

Examinations of ponderosa (Pinus ponderosa Laws.), Austrian (P. nigra Arnold), and Scotch pines (P. sylvestris L.) did not reveal any injury to the cambial regions, but the needles of the current season's growth on some trees appeared to have been definitely damaged and were turning brown. With the presence of Sphaeropsis ellisii Sacc. already reported in Nebraska [1], the weakened condition of the injured twigs may be ideal for a spread of this semi-parasitic fungus next spring. Open-grown Oriental arborvitae (Thuja sp.) also showed considerable damage to the foliage, especially on the south and west sides of these shrubs. The cambial regions, however, appeared uninjured.

Examination of trees in shelterbelt and ornamental plantings in north-central Nebraska showed that Chinese elm was injured severely throughout the area inspected. Trees of this species 5 years old or younger

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1/ Lancaster, F.R. Pine tip die-back in Nebraska. Plant Disease Reporter 23: 126. 1939.

Table 1. Probable injury of trees and shrubs in leaf at Lincoln, Nebraska, November 11, 1940.

Species	Leaf condition at time of freeze	Probable injury
Ailanthus (Ailanthus altissima (Mill.) Swingle)	Full	Slight
Apple (Pyrus ioensis Carruth.)	Partly	Slight
Birch (Betula pendula Roth.)	Full	Slight
Cherry (Prunus cerasus L.)	Full	Severe
Elm, American (Ulmus americana L.)	Partly	Moderate
Chinese (U. pumila L.)	Full	Severe
English (U. procera Salisb.)	Full	Severe
Hawthorn (Crataegus sp.)	Full	Severe
Lilac (Syringa vulgaris L.)	Full	Slight
Mulberry (Morus alba tatarica (L.) Ser.)	Full	Slight
Oak, bur (Quercus macrocarpa Michaux)	Partly	Slight
Pin (Q. palustris Muenchh.)	Full	Slight
Pear (Pyrus communis L.)	Full	Moderate
Plum (Prunus americana Marsh.)	Full	Slight
Poplar, Bolleana (Populus alba pyramidalis Bunge = P. bolleana Lauche)	Full	Slight
Cottonwood (P. deltoides Marsh.)	Partly	Slight
Lombardy (P. nigra italica Muenchh.)	Full	Slight
Privet (Ligustrum vulgare L.)	Full	Severe
Spirea (Spiraea vanhouttei (Briot) Zab.)	Full	Slight
Sycamore (Platanus occidentalis L.)	Partly	Slight
Roses (Rosa spp.)	Full	Severe

showed serious browning of the cambial region about 1 foot from the ground. The tops in most cases were apparently not so badly damaged. Injury to the root crowns was prevented by protection afforded by snow drifts at the base of the trees. The severe injury to Chinese elm was probably due to the fact that this species is among the last to shed its leaves and become dormant. Mulberry showed slight injury in some localities while American elm appeared somewhat more seriously damaged. Such species as green ash, hackberry, honey locust, cottonwood, and willow were apparently only slightly injured. Damage was most severe where moisture was abundant, such as shown by trees adjacent to ditches.

Nursery stock sent in by the Prairie States Forestry Project from Kansas showed damage to the cambial region, (Tables 2 and 3).

Table 2. Damage to first-year nursery stock from Abilene, Kansas [a/] (Duration of freeze, 7 days. Temperature range, 1° to 67° F.)

Plants examined	Probable injury				Remarks
	None	Slight	Moderate	Severe	
Apricot (Prunus sp.)				x	Discolored to ground
Ash, green (Fraxinus pennsylvanica lanceolata (Borkh.) Sarg.)		x			Tips discolored
Catalpa (Catalpa speciosa Warder)				x	Discolored to ground
Coffeetree (Gymnocladus dioicus (L.) K. Koch.)	x				No discoloration
Cottonwood (Populus deltoides Marsh)			x		Tips discolored
Chokecherry (Prunus virginiana L.)		x			Tips discolored
Elm, American				x	Discolored almost to ground
Elm, Chinese				x	Discolored almost to ground
Locust, black (Robinia pseudoacacia L.)		x			Slight discoloration
Locust, honey (Gleditsia triacanthos L.)		x			Tips discolored
Mulberry		x			Tips discolored
Oak, bur	x				Tips discolored
Osage-orange (Maclura pomifera (Raf.) Schneid.=Toxylon pomiferum Raf.)				x	Discolored within one foot of ground
Olive, Russian (Elaeagnus angustifolia L.)	x				Tips discolored
Plum, American		x			Discoloration
Plum, sand (Prunus angustifolia Marsh [var. watonsii (Sarg.) Waugh])				x	Discolored to ground
Walnut, black (Juglans nigra L.)		x			Tips discolored
Cedar, salt (Tamarix gallica L.)		x		x	Discolored to ground

[a/] Silt loam soil, pH 6.0 to 6.4

Table 3. Damage to first-year nursery stock from Hutchison, Kansas [a/] (Duration of freeze, 7 days. Temperature range, -2° to 66° F.).

Plants examined	Probable injury				Remarks
	None	Slight	Moderate	Severe	
Apricot				x	Discolored to ground
Catalpa			x		Tips discolored 6 to 8 inches.
Elm, Chinese				x	Discolored almost to ground
Locust, black		x			Tips discolored
Locust, honey	x				No discoloration
Mulberry, Russian		x			Slight discoloration
Osage-orange			x		Discolored back one foot from tips
Desertwillow (Chilopsis linearis (Cav.) Sweet)				x	Discolored to ground

a/ Sandy loam soil, pH 5.5 to 6.0

The Soil Conservation Service nursery stock at Manhattan, Kansas, showed some interesting variations in freezing injury as shown by an examination of the cambial regions. Buffaloberry (Shepardia argentea Nutt.) was injured to the ground, while the damage to sumac (Rhus trilobata Nutt.) apparently was confined to a freezing back of the terminals. Both of these shrubs are native to this region and are regarded as very hardy. Sand cherry (Prunus besseyi Bailey), another native shrub, was mostly undamaged, although the cambial region of an occasional individual was brown almost to the ground. The Plains cottonwood (Populus sargentii Dode), grown from Texas seed, was discolored to the ground, as was sycamore. Strangely enough, black locust appeared not noticeably damaged although in full leaf at the time. These variations were apparently influenced to some extent by the abundance of soil moisture. Since black locust grows very vigorously, it is possible that this species had exhausted the soil moisture and was actually going into dormancy at the time of the freeze.

It was also interesting that Osage-orange undercut a week before the freeze at this nursery was not as severely injured as the same-aged stock which had not been undercut. Another interesting observation was that Chinese elm stock from early-sown seed was not as severely damaged as later-sown blocks. This is probably a question of maturity in relation to dormancy.

There seems little doubt that some of the Kansas first-year stock such as desertwillow, apricot, salt cedar, catalpa, and American and Chinese elms were severely damaged during the November freeze. In most cases these species will sprout from the root crown in the spring.

Typical nursery stock from Kansas set out in sand in the greenhouse shortly after the freeze, showed at the end of six weeks that the black locust seedlings from Abilene were more severely injured than observational evidence indicated, while Chinese elm was not nearly as badly hurt as it at first appeared. Apparently freezing injury is masked in black locust, while the symptoms for Chinese elm tend to be overemphasized.

A field trip was made in Nebraska a week after the freeze for the purpose of determining the extent of damage to nursery stock at Fremont and Norfolk. It was found that first year nursery stock in Nebraska at the points named was apparently less severely damaged than that grown in Kansas, but some species were seriously injured. The cambial region of American and Chinese elms was frequently found to be brown to within 4 inches of the ground. Black locust and mulberry did not show much injury at the time the examinations were made. Chokecherry and Russian olive both appeared to have the tips of the plants frozen back about one foot. Some individual plants, however, were apparently injured to the ground line. Mulberry and lilac did not appear to be noticeably damaged. Redcedar (Juniperus virginiana L.) transplants (2-1 stock) were frozen back 5 to 6 inches from the top.

Freezing injury for both Nebraska and Kansas nursery stock appeared quite variable, but the one outstanding observation which may be of importance was that within the same species the largest stock appeared to be injured the most severely. This correlation was probably due to the fact that the small stock was in a more dormant condition because of crowding and competition for water. Snow drifts around the base of the seedlings in Nebraska in most cases prevented the freezing of the root crown.

(Division of Forest Pathology, Bureau of Plant Industry, in cooperation with the University of Nebraska).

ADDITIONS TO THE HOST INDEX OF FUNGI OF MOUNT SHASTA, CALIFORNIA

W. B. Cooke

Material of the following species of fungi, in addition to additional material of some of the earlier cited species[1], was collected during the summer of 1940 on Mount Shasta. Some of these species have been checked by authorities mentioned in the earlier report.

Several corrections should be noted for the first list: Dr. Bonar reports that material cited as Neopeckia coulteri on Abies magnifica var. shastensis is Herpotrichia nigra Hart., the Neopeckia occurring only on Pinus spp. Dr. Overholts reports that material cited as Poria subincarnata on the same host is P. lenis; and that material cited as Lophodermium pinastri on Pinus albicaulis is L. nitens Darker. Under Juncus parryi the writer cited as a parasite the smut Cintractia californica. This was the result of an unfortunate misdetermination in the field of the host. Closer examination of the material showed it to be a sedge and Messrs. J. T. Howell and J. W. Stacey of the California Academy of Sciences report it as Carex multicaulis. The fungus then, according to Dr. Zundel, is Cintractia caricis.

In addition to the following material cited with exsiccati numbers other species of the first list have been added to the exsiccati collections. It should be noted that a complete series of these fungi (of both lists) is deposited in the Herbarium of the University of Cincinnati, while partial sets are on file at the Mycological Collections, Division of Mycology and Disease Survey, Bureau of Plant Industry, and in the mycological herbarium of the University of California, Berkeley.

Acer glabrum Torr.
Septoria marginata Heald & Wolf (Exs. 75)

Anaphalis margaritacea (L.) B. & H.
Uromyces amoenus Syd. (Exs. 87).

Anemone occidentalis Wats.
Sorosporium sorosporoides Körn.

Arctostaphylos patula Greene
Pucciniastrum sparsum (Wint.) Fisch. (Exs. 86)

Berberis piperiana (Abrams) McMinn
Cumminsiella sanguinea (Pk.) Arth.

Carex amplectens Mkze.
Puccinia caricis (Schum.) Schroet.

Carex bolanderi Olney
Phyllosticta caricis (Fckl.) Sacc.

1/ Cooke, W. B. Preliminary Host Index to Fungi of Mount Shasta, California. Plant Disease Reporter Supplement 123. Oct. 1, 1940.

Carex multicaulis Bailey
Cintractia caricis (Schum.) Schroet. (Exs. 64, 64A)

Carex nigricans C. A. Mey.
Cintractia caricis (Schum.) Schroet. (Exs. 79)

Epilobium adenocaulon Häusskn.
Pucciniastrum pustulatum (Pers.) Diet. (Exs. 85)

Eriogonum umbellatum Torr. ssp. polyanthum (Benth.) Stokes
Uromyces intricatus Cooke (Exs. 88)

Euphorbia crenulata Engelm.
Uromyces proëminens (DC.) Pass.

Gayophytum helleri Rydb. var. glabrum Munz
Puccinia vagans (DC.) Arth.

Mitella pentandra Hook.
Puccinia heucherae (Schw.) Diet.

Ligusticum grayi C. & R.
Septoria ?petroselini Desm.

Potentilla glandulosa Lindl. ssp. nevadensis (Wats.) Keck
Marssonia potentillae (Desm.) Fisch. var. helleri Pk.
Taphrina potentillae (Farl.) Johanss. (Exs. 115)

Prunus subcordata Benth.
Taphrina pruni-subcordatae (Zeller) Mix (Exs. 72)

Rosa gymnocarpa Nutt.
Phragmidium rosae-californicae Diet.

Rubus parviflorus Nutt.
Phragmidium occidentale Arth. (Exs. 82)

Salix scouleriana Barr.
Melampsora Ribesii-purpureae Kleb. (Exs. 81)

Salvia sonomensis Greene
Puccinia mellifera D. & H. (Exs. 83)

Trifolium involucratum Ort. var. fimbriatum McDerm.
Polythrincium trifolii Kze. (Exs. 74)

On the ground and on or under duff:
Hygrophorus russula (Fr.) Quel.
Mycena griseovirida Smith
*Hydnangium parksii Z. & D.
*Hysterangium darkeri Zeller
*Rhizopogon occidentalis Z. & D.
*Rhizopogon separabilis Zeller
Secotium nubigenum Harkness (Exs. 78)

*(Hypogaeous fungi are included since because of their probable mycorrhizal relationship with native vegetation they may be important components of the mycobiota of any given region.)

NOTES ON FRUIT DISEASES IN THE OZARK SECTION OF ARKANSAS IN 1940

John C. Dunegan

As indicated by the title, this report deals, in the main, with fruit diseases observed in northwest Arkansas during the 1940 season. However, the discussion is not confined entirely to this area and mention is made of other items of interest coming to the attention of the writer from various parts of the state of Arkansas.

In northwest Arkansas the 1940 growing season was initiated by a drop in temperature to as low as 24.5° F. on April 12. Fortunately the freeze did not do as much damage as the spring freeze of 1939, and the majority of the apple orchards had enough fruit left to warrant carrying on the usual spray procedures. Throughout the district the Jonathan and Winesap varieties bore a light crop but the Golden Delicious, Delicious, Stayman Winesap, Collins Red, and Ben Davis crops were not seriously affected.

The rainfall was more uniformly distributed in 1940 than for the past 5 years. There were no periods of prolonged drought and excessively high temperatures to cause excessive dropping or otherwise damage the fruit. Even the Stayman Winesap variety, which is notorious for cracking as it approaches maturity, was harvested in 1940 with a minimum amount of cracked fruit. The favorable environmental conditions and the lack of any very serious outbreaks of fungous diseases in properly sprayed orchards should have made the 1940 season an ideal one. However, the codling moth became very active toward the end of the season and in many orchards the bulk of the fruit was so severely injured that growers were inclined to consider the 1940 season far from an ideal one.

Apple Diseases

Apple Scab (Venturia inaequalis)- Although overwintered apple leaves were examined at various intervals, no mature scab perithecia were found on the leaves during March. A few perithecia with colored ascospores were found on April 11 and additional mature ascospores were found in the collections made April 17. Even at this late date, however, the ascospores in the majority of the perithecia were still not mature.

This delay in the maturation of the ascospores retarded the development of the scab fungus. Some ascospores were probably discharged on April 16 and again on April 26, but the primary lesions were not detected on the new foliage until the first week of May. Scab lesions on the fruit were first observed on May 15.

The weather conditions during April and the first half of May did not favor the development and rapid spread of the scab fungus, and the disease was of comparatively minor importance this season.

Non-sprayed Ben Davis trees used as a check in the 1940 spray experiment had only 22.7 percent of the crop (drops and harvested fruit) infected, as contrasted to 79.7 percent in 1939.

The1940 season is another example of how closely the outbreaks of the apple scab fungus in northwest Arkansas are correlated with the environmental conditions. There was an abundance of overwintered inoculum, yet the environmental conditions at the beginning of the growing season were unfavorable and the fungus caused little damage to the fruit and leaves. The 1939 outbreak, on the other hand, followed a year in which the scab had been of minor importance and the overwintered inoculum was probably at a minimum. The prevalence of the scab fungus in northwest Arkansas in any given season is much more dependent upon the weather conditions prevailing during the first few weeks of the season than it is upon the quantity of inoculum present from the previous year. The Ozark section is so far south that unless ideal conditions prevail at the very beginning of the season and the fungus becomes widely distributed, then the normal high spring temperatures immediately retard the development of the fungus.

Although the scab fungus did not cause any appreciable damage to the bulk of the 1940 fruit crop, it caused some leaf injury in the poorly sprayed orchards. The premature defoliation which followed this injury, however, was not severe enough to induce new shoot growth and fall blooming such as occurred in 1939.

Apple Blotch (Phyllosticta solitaria)- Frequent periods of cool, rainy weather during the months of June and July favored the development of the apple blotch fungus. The first fruit infections were noted on June 17. The non-sprayed trees in the spray experiment had 49.2 percent of the fruit infected as compared to 16.6 percent in 1939, 6.1 percent in 1938, 20.0 percent in 1937, and 11.8 percent in 1935. No figures are available for 1936 as a spring frost eliminated the crop in that year.

The fungus was readily controlled by Bordeaux mixture 2-4-50 and the disease caused no appreciable loss in properly sprayed commercial orchards.

Bitter Rot (Glomerella cingulata)-The frequent showers and humid weather during June and July likewise favored the development of Glomerella cingulata and for the first time in several years the disease was reported in commercial orchards. In northwest Arkansas it was confined to scattered trees and did not cause any severe losses. However, in apple orchards at Conway the disease is reported to have destroyed a considerable portion of the crop in several orchards of Ben Davis, Jonathan, and Grimes Golden varieties.

Cedar Rust (Gymnosporangium spp.)-No specimens of either Gymnosporangium juniperi-virginianae or G. clavipes were observed during the 1940 season. In 1939 nurserymen reported that rust cankers developed on the branches of Early Red Bird, Wilson June, and Winter Banana. No infections were found on these varieties in 1940, according to a report received from an Arkansas State Plant Board inspector.

Black Rot (Physalospora obtusa)-Typical specimens of frog-eye leaf spot were received from Ozone, Arkansas during the last week of July.

Peach Diseases

Winter Injury.-The severe winter weather of January 1940 practically eliminated the commercial peach crop in northwest Arkansas. Samples of peach buds were collected February 1 from four commercial orchards in the Springdale area. These samples were examined and the results are tabulated below:

Orchard	Variety	Age, years	Fruit buds				
			Number			Percent	
			Total	Dead	Alive	Dead	Alive
1	Elberta	4	490	439	51	89.6	10.4
2	Elberta	15	534	484	50	90.6	9.4
3	Belle	8	531	462	69	87.0	13.0
4	Red Bird	5	645	394	251	61.1	38.9

The figures show extensive injury to the Elberta and Belle varieties. The Red Bird variety, while injured, had sufficient live buds for a partial crop.

The spring frost of April 12 caused further losses and only a few scattered peaches of the Elberta and Belle varieties could be found in the orchards at harvest time. The Red Bird, Mayflower, and other early maturing varieties were not so severely damaged and the growers marketed a small crop of these varieties. An almost full crop was harvested in the Crowley Ridge and Nashville areas as the winter temperatures in these sections did not reach the low levels recorded for the Ozark section in the northwest portion of the State.

Brown Rot (Sclerotinia fructicola)-The 1940 season was another season in which, for some unknown reason, the overwintered mummies failed to produce apothecia. Mummies in several orchards were examined regularly during March and April but no apothecia were found. In fact none of the mummies showed even the earliest stages of apothecial formation.

Early in May four overwintered mummies with tufts of viable conidia on them were found in one orchard.

A portion of the crop of the early varieties was destroyed by the brown rot fungus as the fruit reached maturity. Many mummies were formed and a number were buried for observations on apothecial production in the spring of 1941.

Bacterial Spot (Bacterium [Phytomonas] pruni)-Typical spots were found April 25 on young Elberta leaves. With leaf infections appearing this early in the season, a serious outbreak of the disease was anticipated, but further spread of the organism was retarded by the comparatively dry weather during the first half of May. Frequent showers and periods of humid weather during June, however, favored the development of the disease and numerous leaf infections developed by the end of the month.

Although present in practically all orchards of susceptible varieties in the district, the disease was much less severe in 1940 than in 1939 and caused only a moderate amount of defoliation.

In a young orchard near Springdale, Arkansas, that had been severely injured in 1939, the disease did not cause serious defoliation.

A visit was made to peach orchards in the Crowley Ridge section in the eastern part of the State on July 2. Bacterial spot appeared to be the most prevalent trouble in the section. Fruit and leaf infections were found in most of the orchards. Some of the orchards showed severe defoliation. The disease was under commercial control in one Elberta orchard where the zinc-lime spray was used in a regular schedule. There was very little defoliation in this orchard and the leaves had developed the dark green color which follows the use of the zinc-lime spray. Fruit infections, while present in this orchard, were of minor importance commercially.

Rust (Tranzschelia pruni-spinosae discolor)-Rust pustules were found on peach leaves in one commercial orchard on October 26. The few pustules found in 1940 consisted entirely of urediospores. Teliospores have not been found in peach leaves in northwest Arkansas since 1938.

In contrast to the behavior of the discolor variety on peach, the typica variety developed profusely on a cultivated form of Prunus munsoniana. Collections made on September 26 showed the under surface of many leaves almost completely covered with rust pustules. Urediospores and teliospores were present, the latter in great numbers.

The typica variety did not develop to any marked extent on the common wild cherry (Prunus serotina) although a few scattered pustules were found late in September on various trees in the district.

Frosty Mildew (Mycosphaerella persica)-Specimens of this disease were received October 26, 1940, from a commercial peach nursery at Amity, Arkansas. The disease was not encountered this year in northwest Arkansas but has been seen occasionally in past seasons on non-sprayed trees.

Peach Leaf Curl (Taphrina deformans)-The lack of rain during the early part of the growing season retarded the development of the fungus and the disease was of minor importance in 1940. Infections were first noted on non-sprayed trees during the week of May 5 to 11.

Peach Rosette. -In the 1939 summary it was reported that three trees in a group of abandoned peach trees near Rogers, Arkansas were affected with rosette [virus]. The diseased trees were destroyed in the fall of 1939 by an employee of the Arkansas State Plant Board. The locality was visited in September, 1940, and no new cases of rosette had developed in the group of trees. Three peach trees similarly affected were destroyed in the fall of 1939 near Omaha, Arkansas by the Arkansas State Plant Board. In 1940 rosette developed on four more peach trees. These were also destroyed by the State Plant Board.

Spray Injury to Peaches. -Typical specimens of arsenical injury to the fruit were received from Pocahontas, Arkansas on July 18. Hydrated lime had been omitted from the spray mixture by the grower with disastrous results, the specimens representing the most aggravated case of arsenical injury seen for several years. Additional specimens were received from Conway, the following week, and here again improper spray mixtures were the cause of the trouble.

Root Drowning of the Peach. -An interesting example of root drowning was encountered at Van Buren, early in July. An experimental planting of peach, plum, pear, and apple trees had been made in river bottom land on a farm devoted primarily to the production of hybrid corn. The fruit trees were planted to "see how they would do" on this land where the water table is near the surface during periods of rainy weather. One peach tree was dead and the others showed symptoms of root drowning to a varying degree. The apple, pear and plum trees were making good growth and apparently were not suffering from the effects of the high water table.

Stem Cankers (Physalospora obtusa)-As reported in a recent number of the Plant Disease Reporter, the apple black rot fungus was isolated from peach nursery stock. The specimens were received from Amity, in the fall of 1940 and represent the second instance of Physalospora obtusa on peach encountered by the writer. In 1930 this organism was isolated from cankers on peach nursery stock from Beebe.

In both cases the trees showed mechanical injuries and it is believed that the black rot organism entered through these injuries.

Plum Diseases

Bacterial Spot (Bacterium [Phytomonas] pruni)-Excellent fruit specimens of bacterial spot were collected at Fayetteville and Van Buren on trees of the Shiro variety. Very serious defoliation and marked distortion of the twigs due to canker formation accompanied the outbreak of the disease on this susceptible variety.

Brown Rot (Sclerotinia fructicola)-The brown rot organism caused considerable loss in one planting of the Shiro variety. The fruit, which was affected with bacterial spot, cracked as it approached maturity and the brown rot organism gained entrance through the exposed tissues.

Rosette.-Two plum trees developed rosette in the nursery near Omaha, Arkansas where rosette [virus] has been reported on peaches in 1939 and 1940.

One of the plum trees had been budded twice so that one half of the tree had developed from a bud of "Best's Hybrid" while the other half had developed from a bud of the Honeymoon variety. "Best's Hybrid" is a variety from New Zealand according to the nurseryman. Rosette symptoms developed only on the "Best's Hybrid" half of the tree.

Cherry Diseases

Cherry Leaf Spot (Coccomyces hiemalis)-In spite of the unusually moist, cool spring and summer, commercial cherry growers report that the leaf spot fungus caused little damage in 1940. It is probable that the short period of dry weather as the season began had the same effect upon the development of the overwintering ascigerous stage of Coccomyces hiemalis that it had upon the perithecia of the apple scab fungus.

(Division of Fruit and Vegetable Crops and Diseases, U. S. Bureau of Plant Industry, and Arkansas Agricultural Experiment Station.)

DISEASES OF FRUITS AND VEGETABLES ON THE NEW YORK MARKET DURING THE MONTHS OF APRIL TO SEPTEMBER, 1940, INCLUSIVE

C. O. Bratley and James S. Wiant

APPLE:

Most carlots of northwestern-grown Winesap apples seen during May and June contained between 1 and 2 percent blue mold rot (Penicillium expansum). This percentage is but slightly higher than usual for these months.

Gravenstein apples from California arriving during August contained somewhat less than the usual amounts of bitter pit (physiological). In an occasional lot as high as 15 percent of the fruit was affected. More advanced maturity at picking evidenced by the better color of the fruit was undoubtedly a factor in reducing the amount of bitter pit this season.

ASPARAGUS:

California asparagus continued to arrive in unusually poor condition. The decay was primarily bacterial soft rot (Erwinia carotovora) affecting chiefly the tips of the spears and to a lesser extent the cut

ends of the butts. The decay was most prevalent about April 8-12. Asparagus arriving during that period was harvested soon after the heavy rains and floods that occurred during the last week in March. Information obtained on 105 carlots (representing approximately one-fifth of total receipts) indicated that an average of about 5 percent of the stalks were affected in 91 carlots while in 14 carlots no decay was observed. In a few individual lots decay losses ran as high as 45-55 percent.

CELERY:

A number of lots of Florida celery observed in April were found affected with pithiness of the outer leaf petioles. Bacterial soft rot (Erwinia carotovora) in early stages was frequently present in the center of affected petioles.

CHERRY:

In very few shipments of cherries from the Pacific Northwest was brown rot (Sclerotinia fructicola) important. The decay most commonly encountered was cladosporium rot (Cladosporium sp.) which affected 2 or 3 percent of the fruit in many shipments. It was usually inconspicuous, lining skin breaks and producing a low growth of light colored mycelium that early turned dark green.

GRAPE:

A shipment comprising 50 carlot equivalents of table grapes that arrived from South Africa in May contained less than 1 percent of gray mold rot (Botrytis sp.). In most lugs the stems were turning brown and in a few they were moldy. About 5 percent of the Almeria grapes showed the physiological spotting characteristic of this variety.

Grapes from Argentina arrived in increasingly poor condition during April and May as the shipping season neared its end. In some lots over half of the grapes were affected with gray mold rot and in at least 10 lots noted there was more than 10 percent decay. Most of the shipments contained 2 or 3 percent of the rot and many moldy stems.

LIME:

Tahiti limes during the summer showed less stylar end rot (physiological) than had been noted during the previous two seasons.

ORANGE:

Florida oranges continued to arrive during April and May with less than usual amounts of stem-end rot (Diplodia natalensis and Phomopsis citri). An occasional lot showed serious dryness of the juice segments extending deeper than 1/2 inch into the fruit.

PEA:

Many carlots of California peas arriving during the latter part of April had from 15 to 25 percent of the pods seriously blemished by brownish black lesions of unknown cause. Frequently this was accompanied by Ascochyta blight.

PEACH:

A decay that had not previously been seen on the New York market was found affecting an occasional fruit in shipments of Hiley and Elberta peaches from Georgia in June and July. It appeared as very small (3/16 inch) circular, sunken tan spots in the skin of the ripening peach. At room temperature the spots increased in size to 1/2 inch in three days but retained their circular form and tan to brown color. The surface of the spots became corrugated in a concentric pattern and bore numerous acervuli that under moist conditions produced abundant pink spore masses. In early stages the decay was only skin deep, but it quickly developed toward the pit in a cone-shaped mass of firm brown tissue that could be separated easily from the healthy flesh. The organism was isolated and, upon inoculation into sound peaches, produced the characteristic symptoms. It has not as yet been identified but closely resembles Glomerella cingulata, the fungus causing bitter rot of apples.

PEAR:

Alternaria rot (Alternaria sp.) was noted affecting 2, 5, and 8 percent of thefruit respectively in three carlots of Anjou pears from Oregon in April. This slowly developing, black decay started at skin breaks, mostly stem punctures.

A wilted, flabby appearance of the pears along the edges of the packed boxes was seen in many lots of Anjou pears held in storage until April and May.

PLUM:

Many September rail arrivals of Italian type of prune plums contained small amounts of rhizopus rot (Rhizopus nigricans) and blue mold rot (Penicillium sp.). From 2 to 5 percent of the fruit was affected in a number of lots examined.

POTATO:

During the last week of March and the first two weeks of April more instances of the occurrence of internal browning of Maine Chippewa and Katahdin potatoes (see Pl. Dis. Reptr. 23: 376, 1939) were noted than during either of the two previous years. Affected tissues were reddish-brown. Where confined to internal tissues the discoloration was apparent only upon cutting the tuber. Where tissues close to the surface were affected the trouble could readily be recognized without cutting. From

little to all of the tuber was found discolored. The prevalence of the trouble within a given lot of sacks varied from a trace to 1 percent at one extreme to as much as 85 or 90 percent at the other extreme. Two large lots observed had an average, respectively, of 10 to 25 percent and 50 percent of the tubers affected.

Federal-State shipping point inspectors report that this internal browning peculiar to the Chippewa and Katahdin varieties is found only late in the storage season and is much worse in sections of the bins exposed to the lowest temperatures. However, it is not found associated with frozen tubers.

More than usual amounts of surface blackening and stickiness of potatoes shipped from the Hastings section of Florida were observed during late April and early May. The cause of the trouble was undoubtedly a bruising and drying out of the surface tissues.

Bacterial soft rots were unusually prevalent in South Carolina potatoes. It was not uncommon to find in many carlots from 40 to 50 percent of the bags set aside for separate sale because of visible wet spots from leaking tubers. Sometimes 75 percent of the bags were thus wetted. The amount of decay present in such bags varied widely with from few to many tubers affected.

Sporadic losses from bacterial soft rots were noted in the crop shipped from North Carolina. For the season as a whole the losses were from slight to moderate in degree--sharply contrasted with those of the previous season.

Potatoes from the Eastern Shore of Virginia for the most part arrived in excellent condition with little decay present.

TOMATO:

During early July 3 cars shipped from the northeastern part of Texas arrived with 2 to 5 percent of the tomatoes affected with a Phomopsis rot. This is the first time that we have observed this decay. The pathogen produces the perfect stage abundantly in culture and has been identified as Diaporthe phaseolorum.

(Division of Fruit and Vegetable Crops and Diseases)

APPLE DISEASES IN PENNSYLVANIA IN 1940

R. S. Kirby, G. L. Zundel, A. H. Bauer, and H. W. Rankin

Treatments or sprays	Number Orchards checked	Number apples counted	Percentage of diseased apples: **Scab	Brooks spot	Sooty blotch	Blotch	Black rot	Bitter rot	Apple rust	Quince rust	Brown rot	Black pox	Total
*Completely sprayed	116	45,175	1.25	.07	.05	0	.01	.02	.17	.1	0	.001	1.68
Partly sprayed	240	81,060	9.64	.25	1.62	.01	.08	.06	.2	.05	.01	.22	12.12
Unsprayed	38	3,500	67.8	5.8	35.3	1.4	2.9	0	.03	0	0	.3	100.
Total	394	129,735											
Amount of disease present in partly sprayed orchards--seven sprays were recommended in most sections													
Timing off	8	3,300	12.96	.49	.1		.1		.06			3.6	14.04
Spraying method off	9	3,450	16.3	.05	.23				1.4				17.8
Substitute material	19	6,750	4.6	.16	.15		.01	.06	.4	.15	.02		5.6
One spray omitted	140	47,550	5.87	.15	1.09	.01	.03	.1	.2	.03		.2	7.47
Two sprays "	50	13,800	4.3	.16	2.1		.06	.007	.3	.09	.007	.07	12.55
Three " "	33	9,100	17.0	.2	3.82		.15		.12			.6	21.9
Four " "	14	4,500	21.2	0	1.64		.05	.05					22.9
Five " "	5	1,400	15.05	.8	4.					.07	.4		20.4
Six " "	3	810	62.4	6.8	14.8	.38	2.6						37.
Total 1 to 6 sprays omitted	245	77,160	9.56	.23	1.8	.01	.09	.06	.17	.03	.006	.2	12.1
All sprays applied except the one named:													
Delayed dormant	23	8,650	3.5	.02	.02	.06	.05		.06	.01			3.72
Pre-pink	24	8,200	3.4	.13	.11				.2	.04		.02	3.84
Pink	5	1,800	2.										2.
Petal fall	4	1,100	13.8	.1									13.9
First cover	4	1,800	1.4	.05	.3		.17						2.
Second cover	10	2,500	1.7	.12	.4		.04			.04			2.28
Fourth cover	28	7,800	11.5	.68	4.06		.06	.6	.2	.08		1.3	18.6

*Completely sprayed as per college recommendations as to material, time, number of sprays, etc.

**Scab[Venturia inaequalis], Brooks' spot [Mycosphaerella pomi], sooty blotch [Gloeodes pomigena], blotch [Phyllosticta solitaria], black rot [Physalospora obtusa], bitter rot [Glomerella cingulata], apple rust (Gymnosporangium juniperi-virginianae), quince rust (G. clavipes), black pox [Helminthosporium papulosum], brown rot [Sclerotinia fructicola].

A CASE OF THE CROWN GALL ORGANISM PERSISTENT IN GRAIN LAND

L. C. Cochran

Severe infection of crown gall [Phytomonas tumefaciens] was found on seedling and transplanted Prunus nursery trees in plots established for virus disease studies. The contagious nature of the virus diseases concerned made it necessary to choose a location where no stone fruits exist in the immediate locality. For this purpose a piece of land which had been alternately summer-fallowed and cropped to grain was chosen. Local grain farmers residing in the area report that several orchards of apple, pear, and stone fruits were planted on land in the vicinity of the experimental plot when the tract was subdivided, but that these all were removed about 1898, when water rights were lost and irrigation was discontinued throughout the area. Long-time residents report no recollection of any orchard ever existing on the land in question, but apples were removed about 1900 from the adjoining property which drains across the plots.

After finding the disease in the plot, a thorough survey revealed no rosaceous or other crops having crown gall in the vicinity so situated that drainage from these would flow on the plot. The plot is bordered by a citrus grove, from which water drains on it, but careful examination has revealed no crown gall on the citrus. The writer has been assured by C. O. Smith that while it is possible to produce galls on citrus by inoculation with the crown gall organism, the crown gall disease is rare or does not exist on citrus in nature.

Seeds of peach, myrobolan plum, and apricot, and nursery trees of peach, apricot, plum, almond, and cherry were planted in 1938; further plantings were made in 1939. When some of the seedlings from these were dug for discard in January, 1940, they were severely diseased with crown gall. Further examination showed between 95 and 100 percent infection on all the trees in the plot. Seedlings in general had galls ranging from 1/2 inch to 6 inches or more in diameter at the point where the cotyledons had been attached. Transplanted trees had galls on the ends of the roots which had been cut when they were dug in the nursery. Galls also were common at the forks of smaller roots on both seedlings and transplants, indicating infection at the point of rupture of the cortex where lateral roots arose.

After careful examination of the trees there is little reason for doubt that the trees became infected from soil of the plot. Since there are no crops present from which the crown gall organism could spread, it must have existed in the soil since previous hosts were removed. The rather definite history of the land in the fact of loss of water rights establishes this period at about 40 years.

(California Agricultural Experiment Station, Citrus Experiment Station, Riverside.)

A UNIQUE CASE OF POWDERY MILDEW ON LETTUCE IN THE FIELD

Dean E. Pryor

Most of the cultivated varieties of lettuce are resistant to powdery mildew (Erysiphe cichoracearum DC.)1/. This disease is seldom of any importance in the field, but according to Thompson 2/ it may do considerable damage in the greenhouse where the use of resistant varieties is advised. In North America E. cichoracearum is the only powdery mildew reported on Lactuca sativa (cultivated lettuce) and L. scariola (wild lettuce)3/ with which L. sativa readily crosses. This fall several lines of "Iceberg type" lettuce with some promise of commercial importance were planted in field trials near Salinas, California. In a recent visit to these plots, powdery mildew was noticed on strain No. 41858. There was no evidence of this disease on any of the other lettuce lines or in an adjacent field of the Imperial D strain. Examination of the colonies disclosed conidia and mycelium typical of E. cichoracearum, but no perithecia. There was no opportunity to determine the pathogenicity of the fungus for L. scariola, which is common in the area.

By means of perithecia Whitaker and Pryor 1/ have identified Erysiphe cichoracearum as the powdery mildew generally found on Lactuca scariola in California. Their crosses between a resistant L. sativa and susceptible L. scariola indicated that resistance is inherited as a single dominant factor. Examination of the pedigree of No. 41858 showed that 8 generations previously the line had been crossed with L. scariola. The succeeding 6 generations were grown in the Imperial Valley where lettuce powdery mildew seldom if ever occurs. These observations illustrate how undesirable recessive genes may be carried in breeding stock unless conditions happen to be favorable for their expression and subsequent elimination.

1/ Whitaker, Thomas W. and Dean E. Pryor, The inheritance of resistance to powdery mildew (Erysiphe cichoracearum DC.) in lettuce. Phytopathology (In press).

2/ Thompson, R. C. Improvement of Salad Crops. U. S. D. A. Yearbook 1937:326-339.

3/ Seymour, A. B. Host index of the fungi of North America. 732 p. Harvard University Press (Cambridge). 1929.

(Division of Fruit and Vegetable Crops and Diseases.)